

IMIA WGP 49 BOSTON Hazards in paper and pulp Industries – from an engineering insurance perspective



Presented by M Gådin and T Åström at the IMIA Conference, Boston 2006



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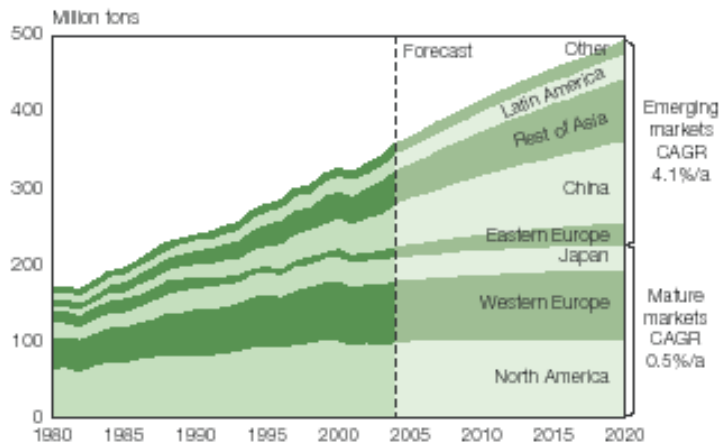
Main Topics of the Paper



- General trends in the pulp and paper industry
- Technical descriptions, developments and Hazards.
- Loss prevention
- Loss examples



General trends in the pulp and paper industry

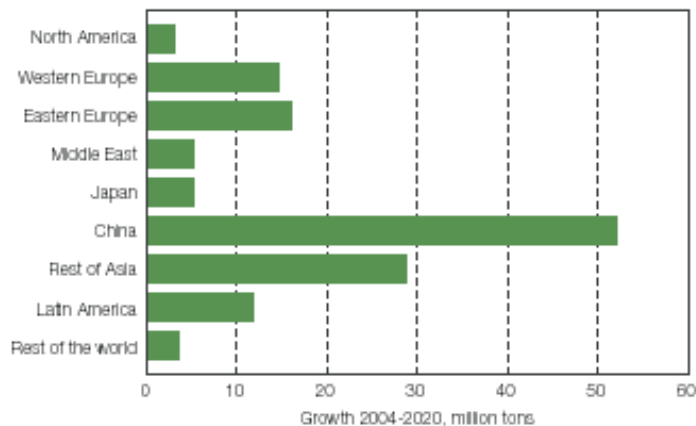


Global production of paper and pulp is 360 Mton/year (2005).

The production will 2020 reaching 500 Mton/year.

The production will gradually be shifted to Asia.

New challenge for the P/P industry



Technical descriptions, developments and Hazards. Pulp



Continues Digester

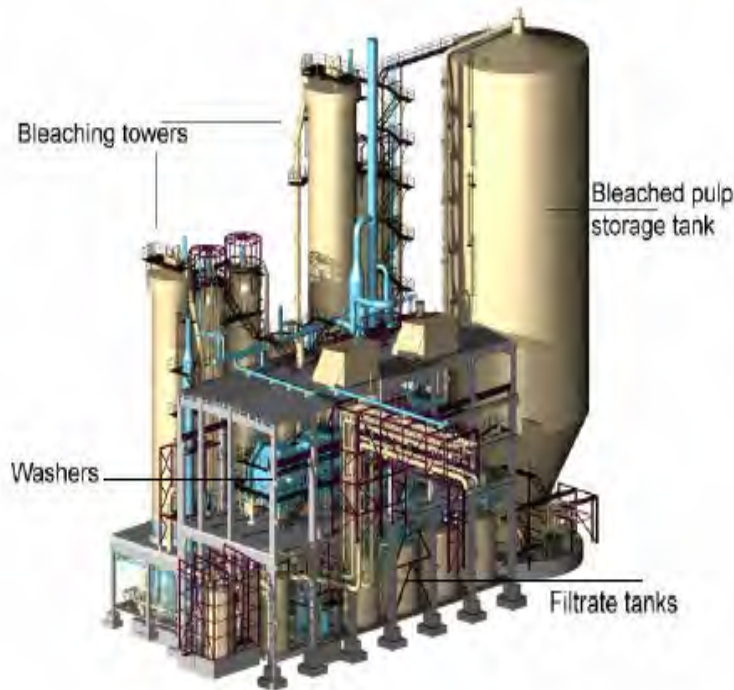
Current trend

- *Sulphate most used process and developed process in the world.*
- *TMP / CTMP*

Hazards

- *Pressure vessel*
- *Fatigue cracks*
- *Large electrical motors*

Technical descriptions, developments and Hazards. Pulp Bleach plant



Current trend

- *Single line*
- *Increased capacity*
- *Size increase of key machinery*
- *New bleaching processes*

Hazards

- *Instable bleaching chemicals.*
- *Exposure to higher BI EML.*

Technical descriptions, developments and Hazards. Recovery boiler

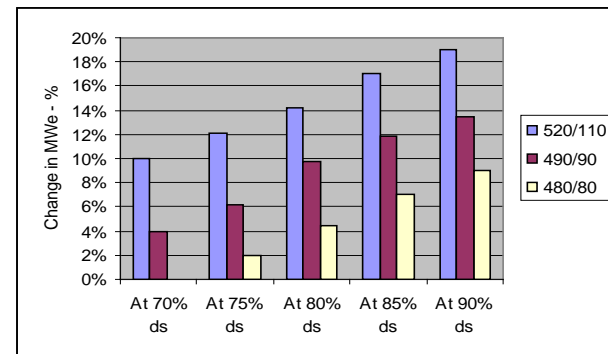
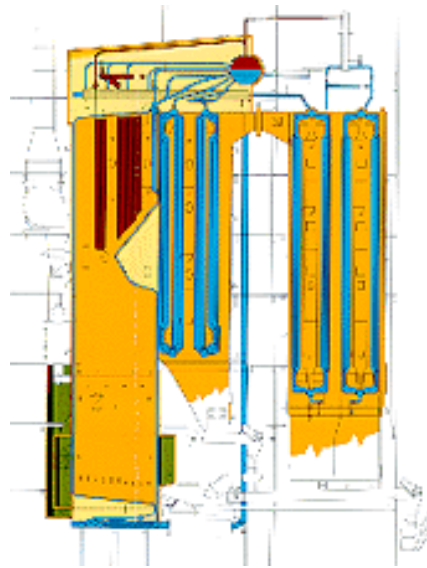


Current trend

- Higher pressure and temperature.
- Increased black liquor solids
- Increased size

Hazards

- Smelt water explosion
- Deposits on the inside of the tubes
- Water supply



Effect of black liquor dry solids content and main steam parameters on electricity generation from recovery boilers



Technical descriptions, developments and Hazards. Paper machines

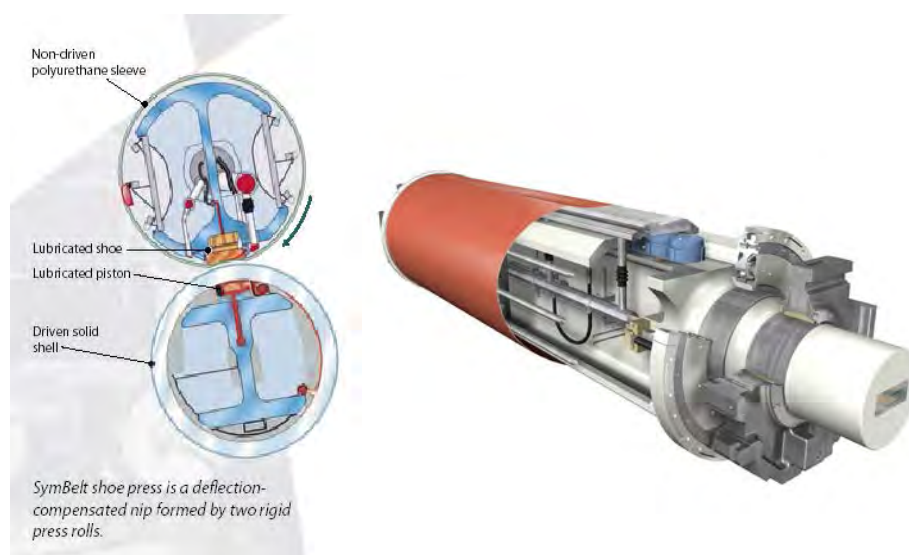


Current trend

- *Increased speed and width.*
- *Shoe press*
- *Dilution controlled head box*
- *Measuring online*

Hazards

- *More energy in movement*
- *More hydraulic oil in the machine*
- *Less employees in the mill.*



Technical descriptions, developments and Hazards. Environment

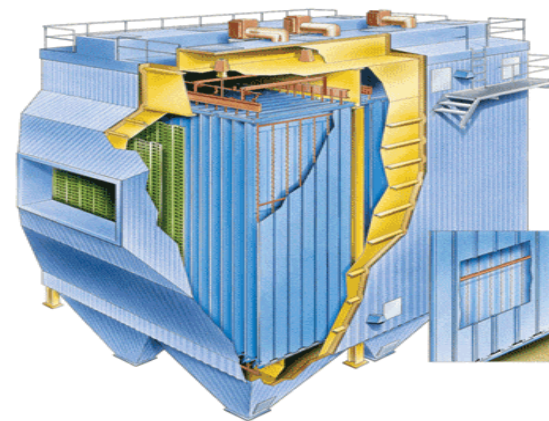


Current trend

- *Closing the water cycle.*
- *More stages of water treatment*
- *Biofilm technology*
- *Collect all non condensable gas*

Hazards

- *Malfunction can close the whole mill.*
- *The microorganism is sensitive to temperature changes.*





CRITICAL COMPONENTS

- CONVEYORS
- CHIPPERS
- DIGESTERS
- DIFFUSORS
- BLACK LIQUOR BOILER AND DISSOLVING TANK
- BOILER FANS
- LIME KILN
- STEAM TURBO-SETS
- MAIN TRANSFORMERS
- PAPER MACHINE
- YANKEE DRYERS

LOSS PREVENTION



MAJOR PREVENTIVE MACHINE DIAGNOSTIC METHODS

- temperature and pressure gauging
- periodical in-service inspection
- Non Destructive Testing (NDT) methods
- vibration measurements and - analyses
- oil-analyses
- thermography
- acoustic emission monitoring
- endoscopy
- electrical overload warning devices
- spark detection devices
- rotation controllers for slippage control
- indicators for misalignment esp. for belts
- Partial Discharge (PD) emission for monitoring ageing of electric isolation material



LOSS PREVENTION CONVEYORS



CHECK-LIST

- sprinklers
- spark detection devices
- vibration measurement of bearings
- thermography of bearings
- rotation controllers for slippage control
- indicators for misalignment of the belts
- over-load warning devices for driving motors



LOSS PREVENTION CHIPPERS

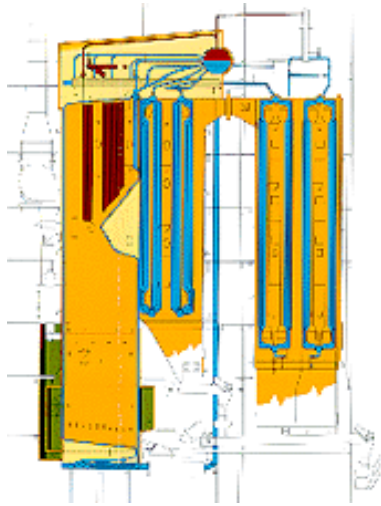


CHECK LIST

- vibration measurements of gearbox bearings and chipper axle
- system for securing assembly of blades
- oil- warmers or synthetic oil in cold climates
- periodical oil-analyses of gearbox oil
- acoustic emission monitoring for structural cracking and wearing of blades

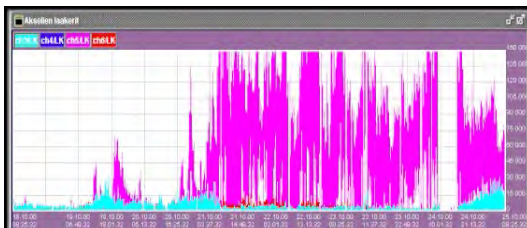


LOSS PREVENTION RECOVERY BOILER and DISSOLVING TANK

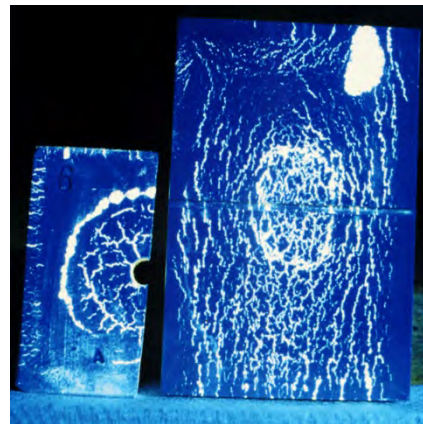


CHECK LIST

- furnace cameras
- temperature sensors connected as protection devices and not only as warning devices
- doubling or tripling of drum water level monitoring
- doubling or tripling of green liquor level monitoring in the dissolving tank
- deviation of water/steam production level by manual or on-line monitoring
- acoustic emission monitoring for structural cracks and leakages



LOSS PREVENTION BOILER FANS



CHECK LIST

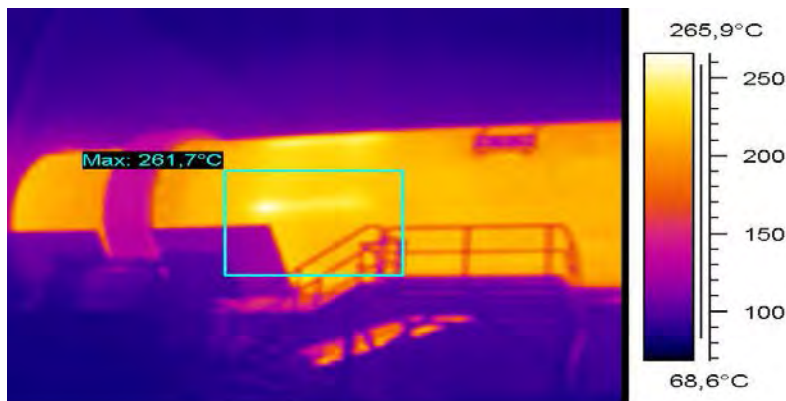
- on-line vibration monitoring of bearings or
- systematic periodic vibration measurements
- on-line or periodic temperature measurements of bearings
- in-service NDT for crack detection
- over-load warning devices for driving motors



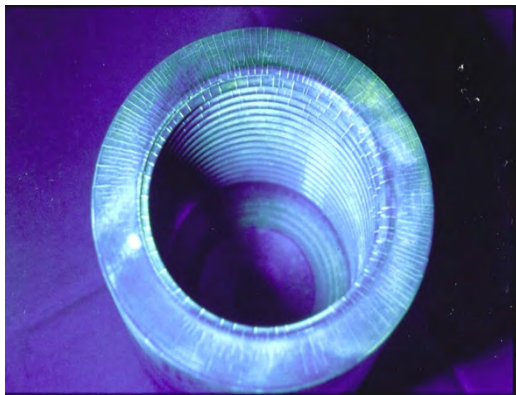
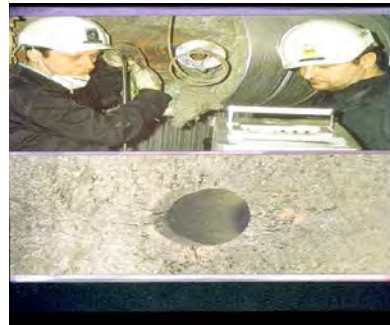
LOSS PREVENTION LIME KILN



- CHECK LIST
- vast temperature gauging
- on-line thermography
- in-service NDT- testing program for the gearbox
- periodic or on-line vibration measurement of bearings
- oil-warmers or synthetic oil in cold climates
- periodical oil-analyses of gear box oil
- acoustic emission monitoring of gear-box(es) and rolls
- a plan for turning the kiln if the gearbox is damaged



LOSS PREVENTION TURBO-SETS



CHECK LIST

- the in-service maintenance programme including the systematic function checks
- the inter-activeness of the in-service maintenance programme
- vibration, temperature and pressure sensors used as protection devices and not only as warning devices
- periodical endoscopy of blades
- periodical oil-analyses of both the hydraulic and the lubricating oil
- use of a Partial Discharge (PD-) system for monitoring ageing of isolation material

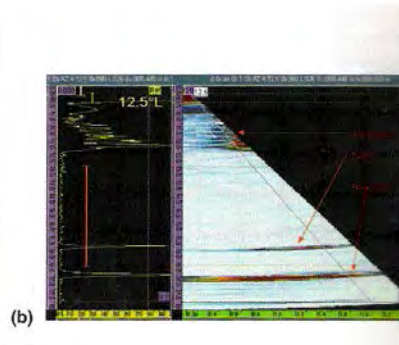
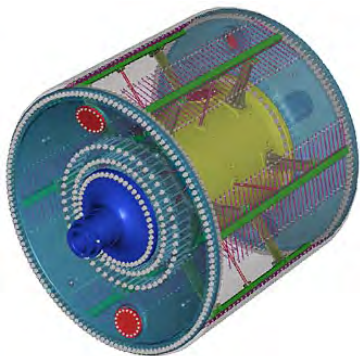


LOSS PREVENTION YANKEE DRYER

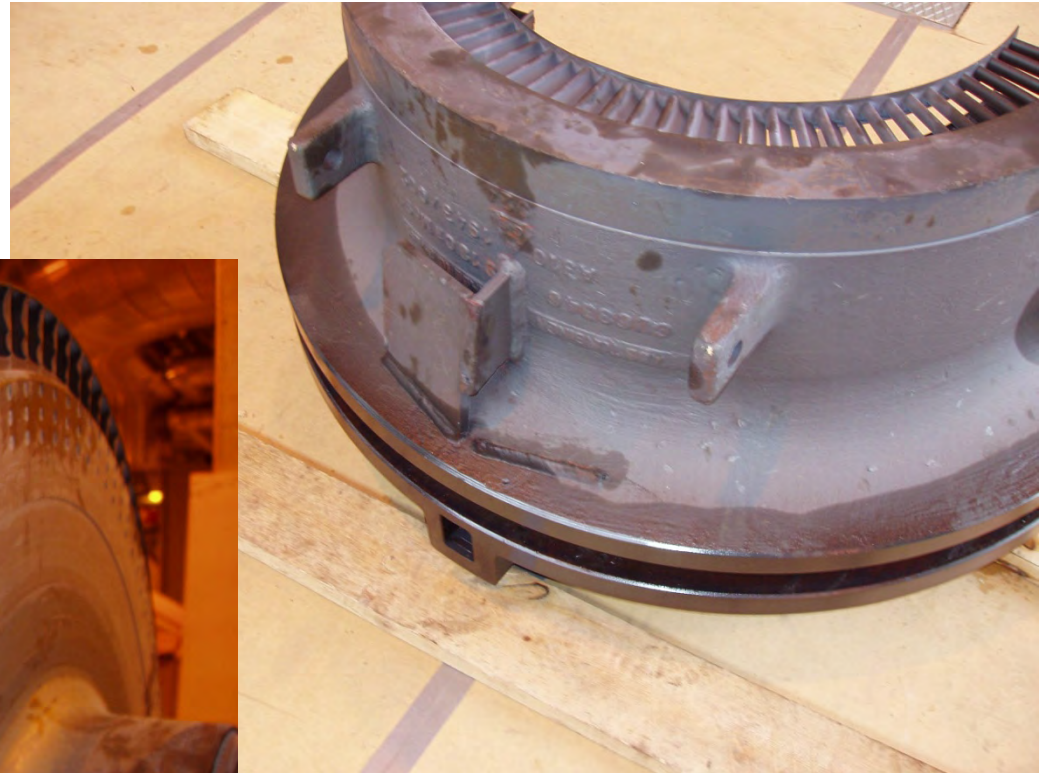
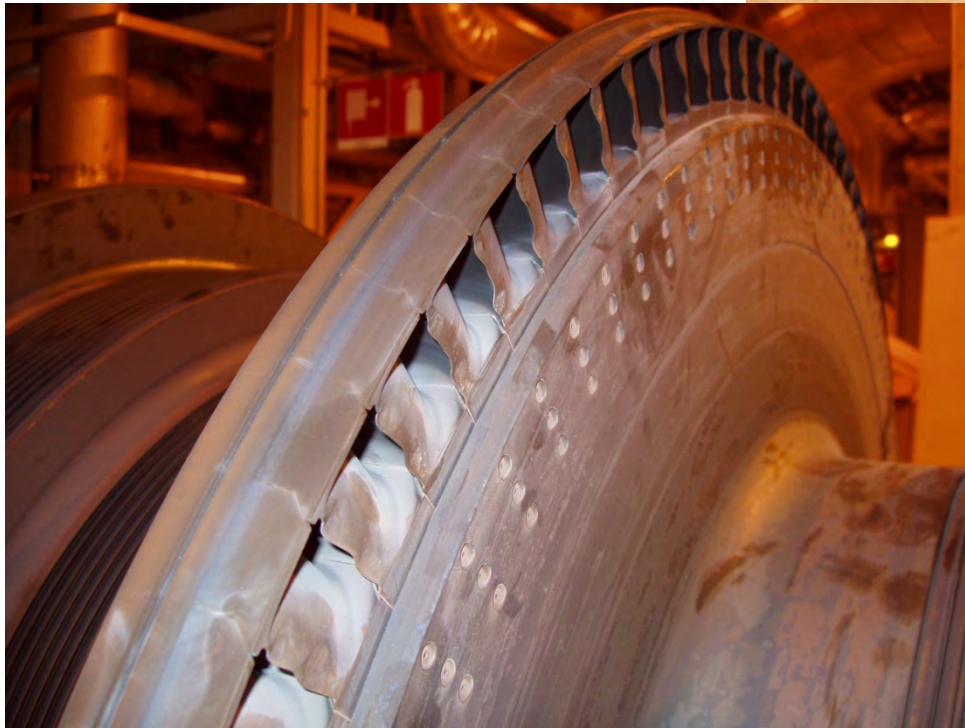


CHECK LIST

- the systematic in-service testing programme for the critical parts of the vessel i.e. bolt-rows and the central axis
- main NDT-methods of the structure are visual testing, and magnetic particle testing
- bolts and shell thickness are to be tested using ultrasonic testing
- the plating thickness can be measured using Eddy current testing
- periodic or on-line vibration measurement is recommended for gear-box bearings



Loss examples. Breaking of shield, Steam turbine



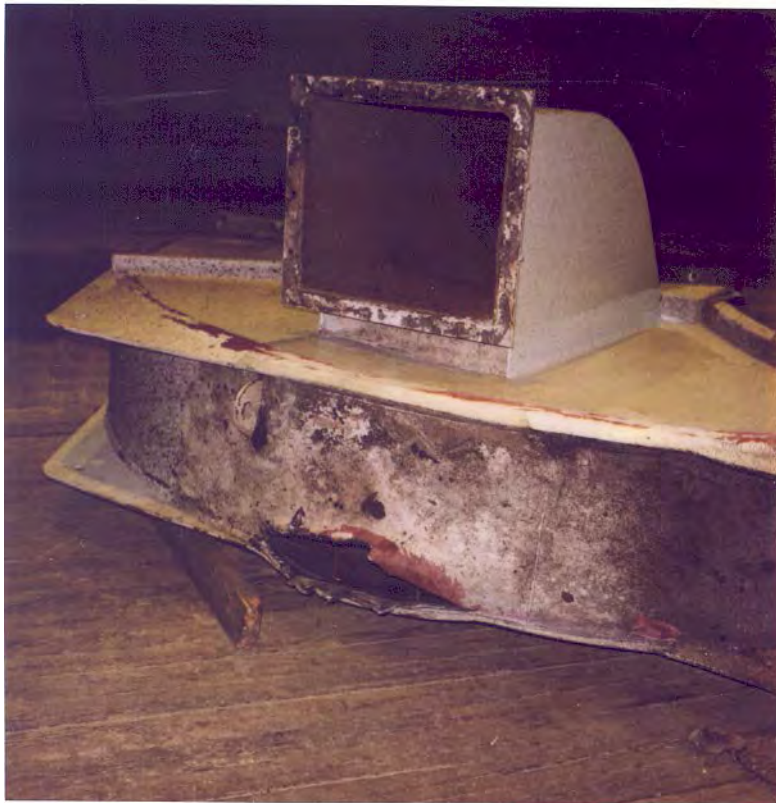
Loss examples. Smelt water explosion recovery boiler.



Loss examples. Over heating in Lime kiln



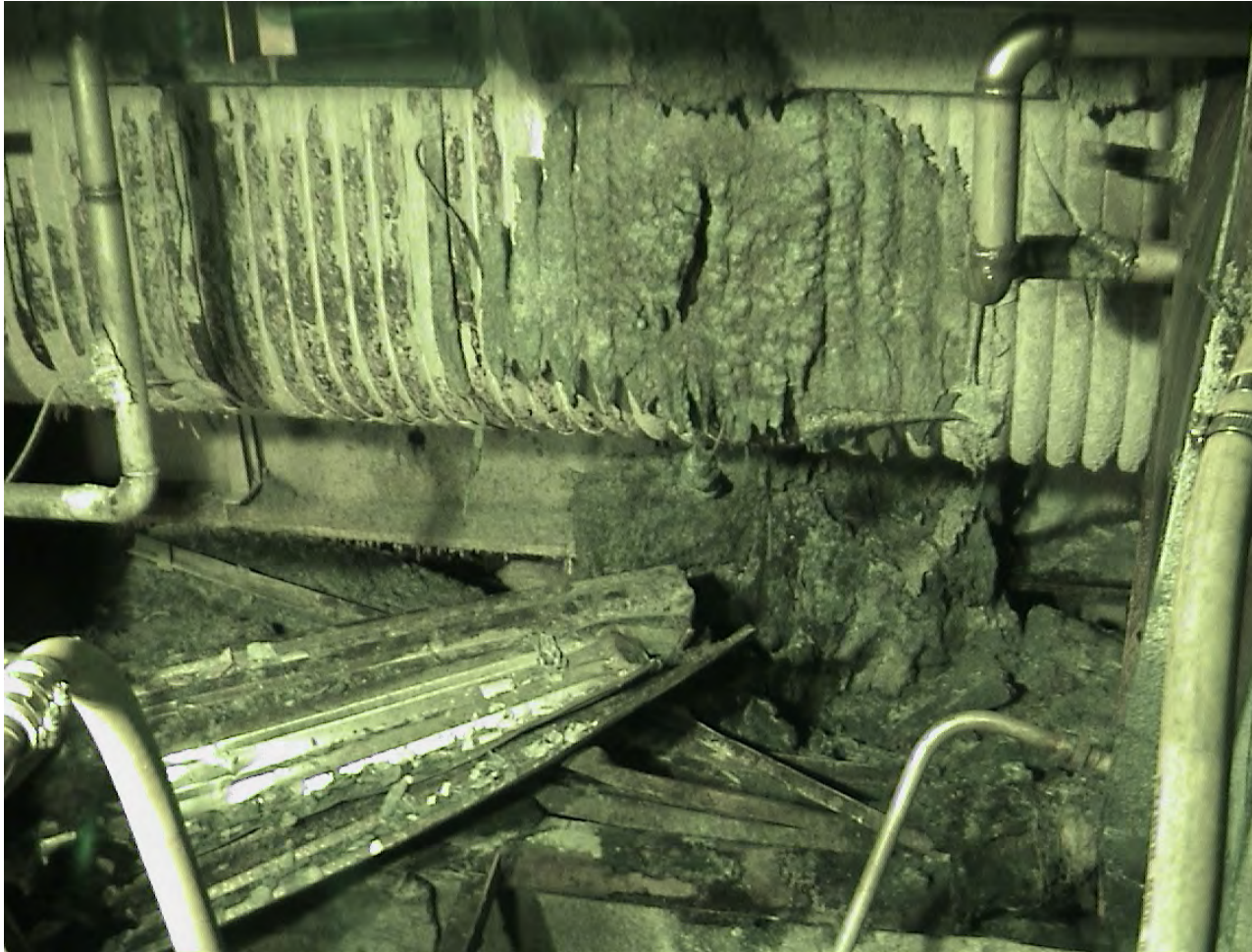
Loss examples. Loose blade in Chipper



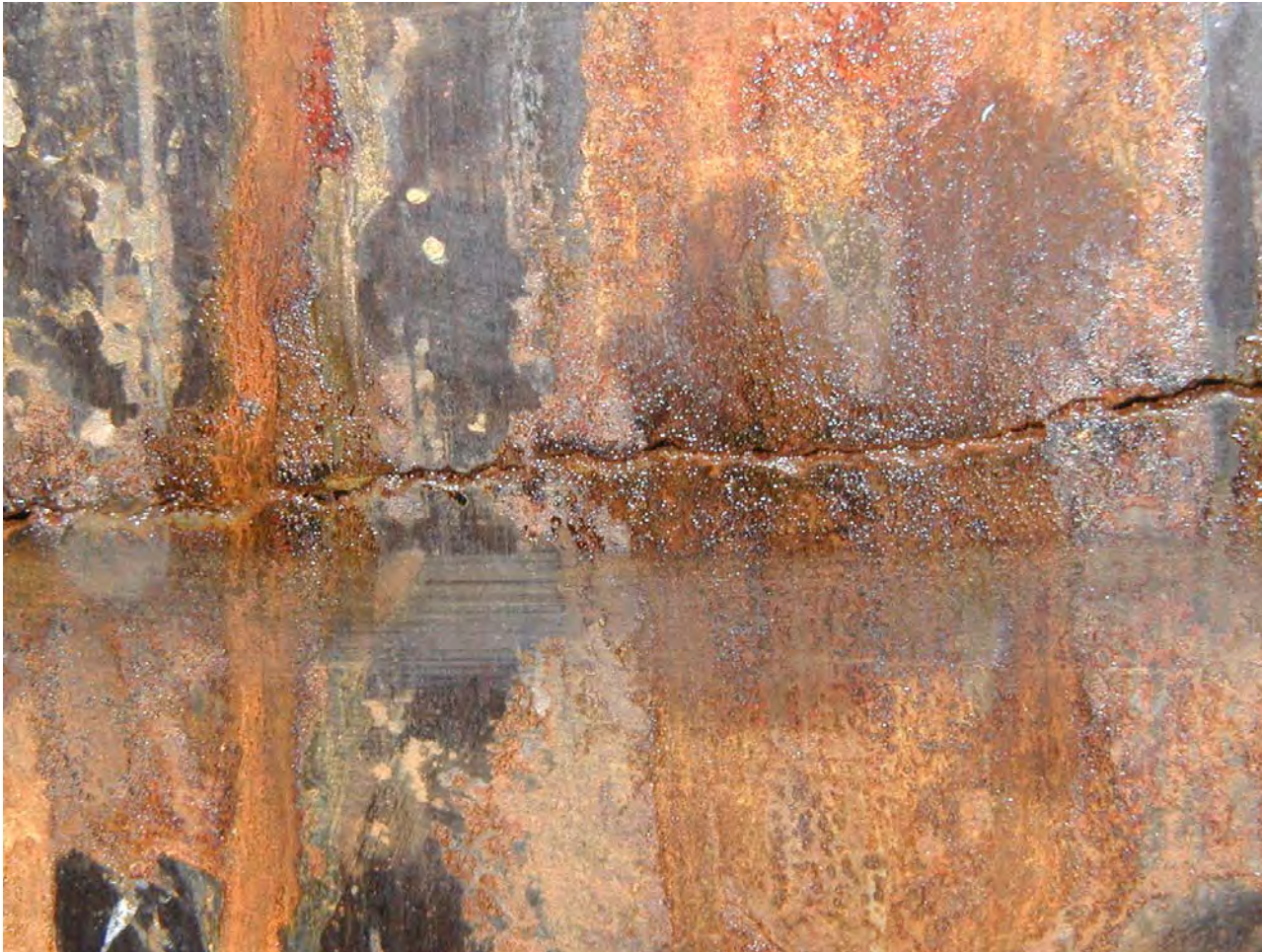
Loss examples. No clearances in Steam turbine



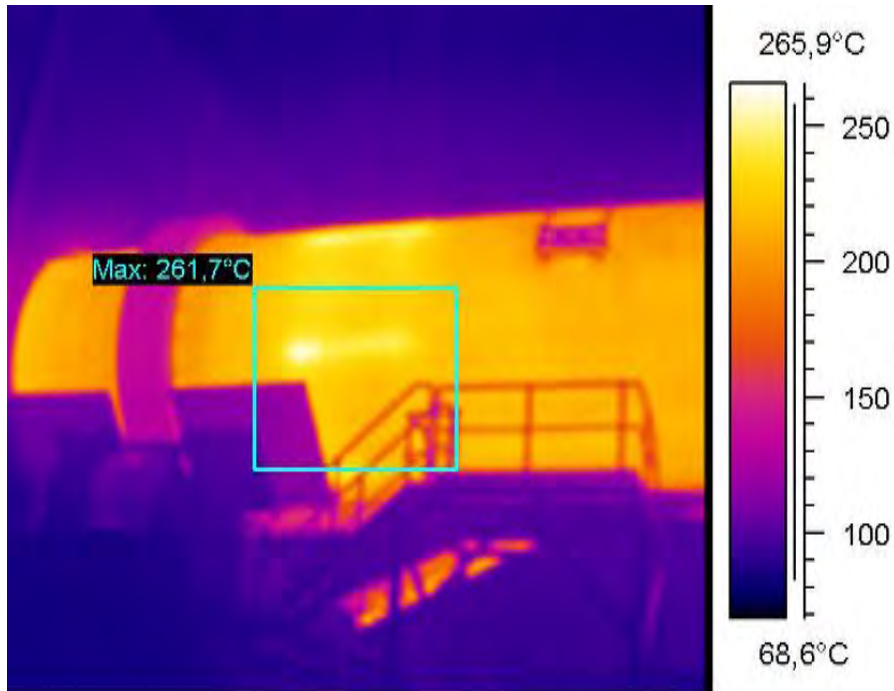
Loss examples. Dissolving tank with a frozen pipe



Loss examples. Yankee dryer crack



Loss examples. Lime Kiln failure brick lining



Loss examples. Lime Kiln failure brick lining

